

01 - Introduction

Multi-tiered architecture, Java EE

AMT 2018

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Intro to Java EE	15'
Intro to client and presentation tiers	15'
Experiments with the simple MVC project	15'
Break	5'
MVC, Pipes and Filters and IoC patterns	15'
Challenge (HTML form processing)	60'
Review of the challenge	10'
Summary	5'



Introduction

Multi-Tiered Applications



Multi-Tiered Applications



The application is structured in “tiers” (tranches)

Multi-Tiered Applications

Frameworks



APIs



Servlet

EJB

JDBC



JSP

JAX-RS

JPA



JAX-WS



Java EE
Application Server

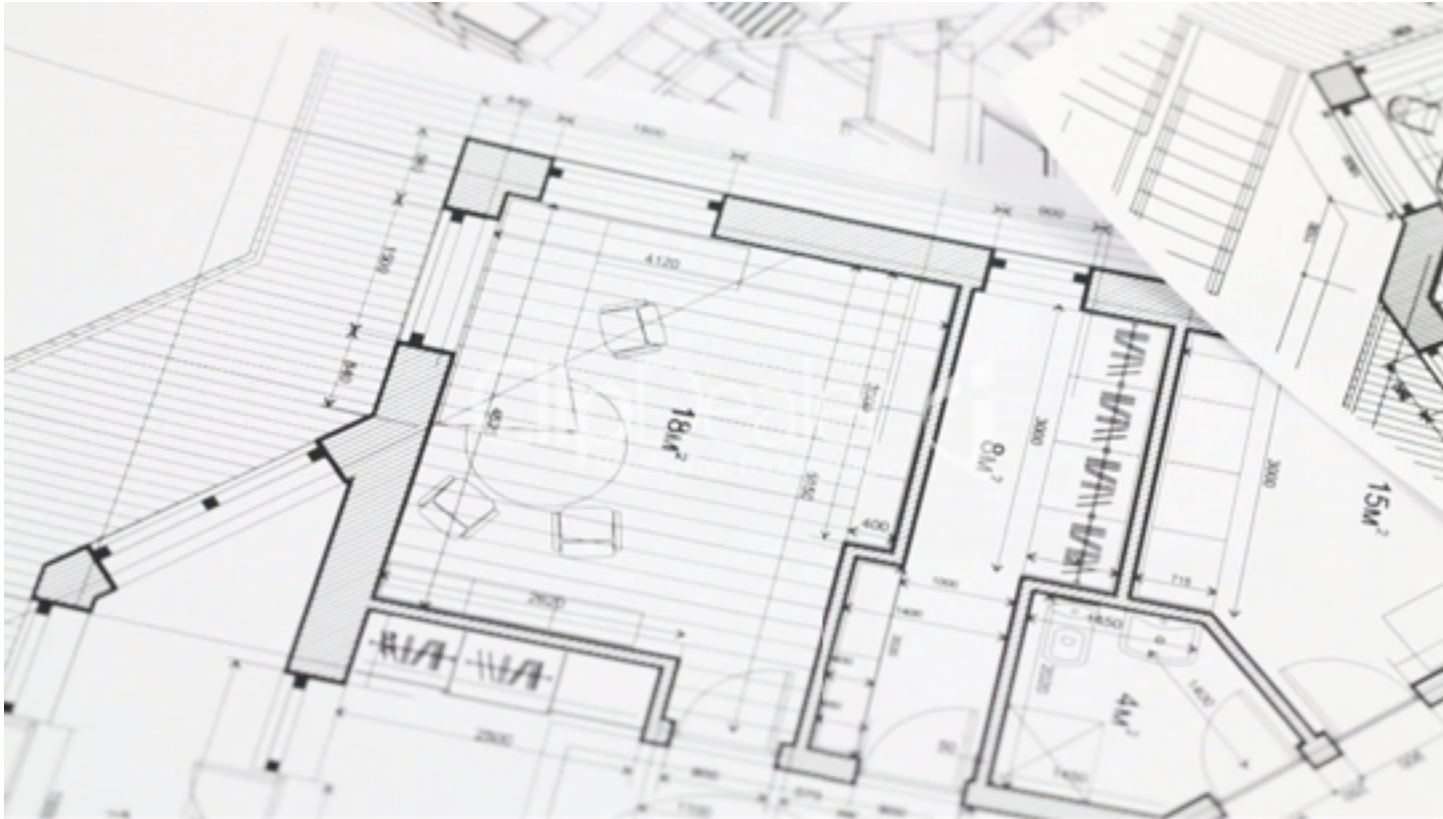
JMS

Tools



Jenkins



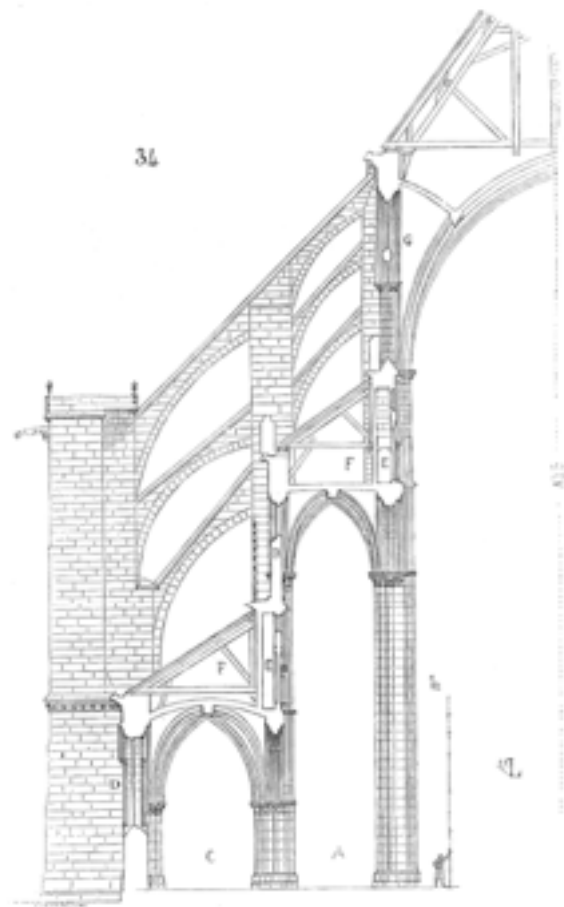
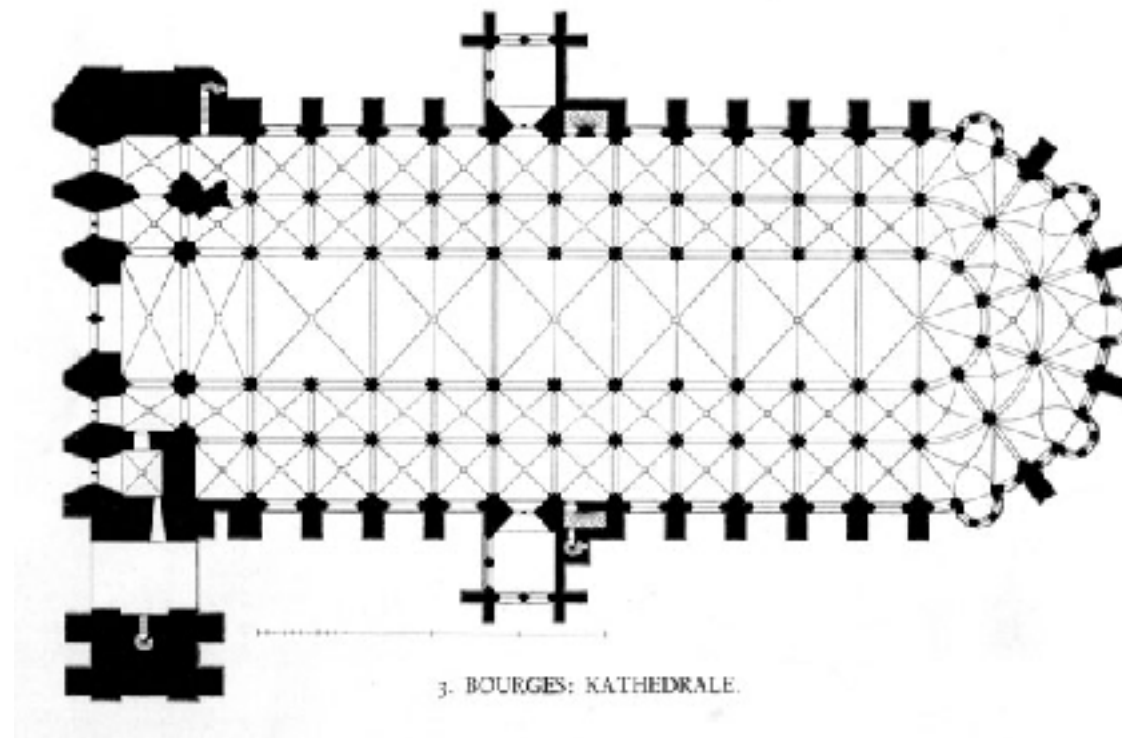


Architecture

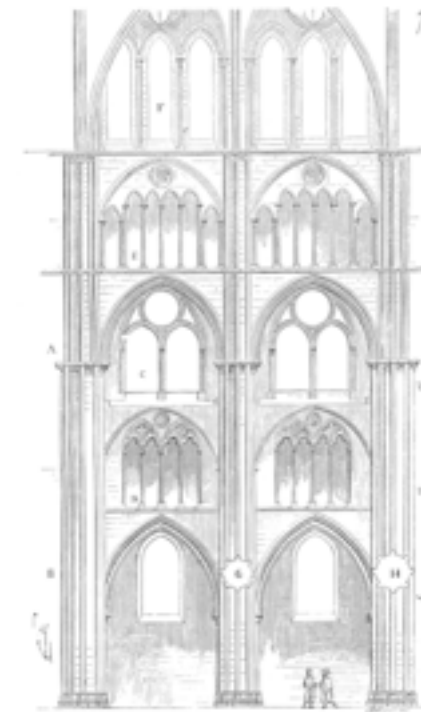


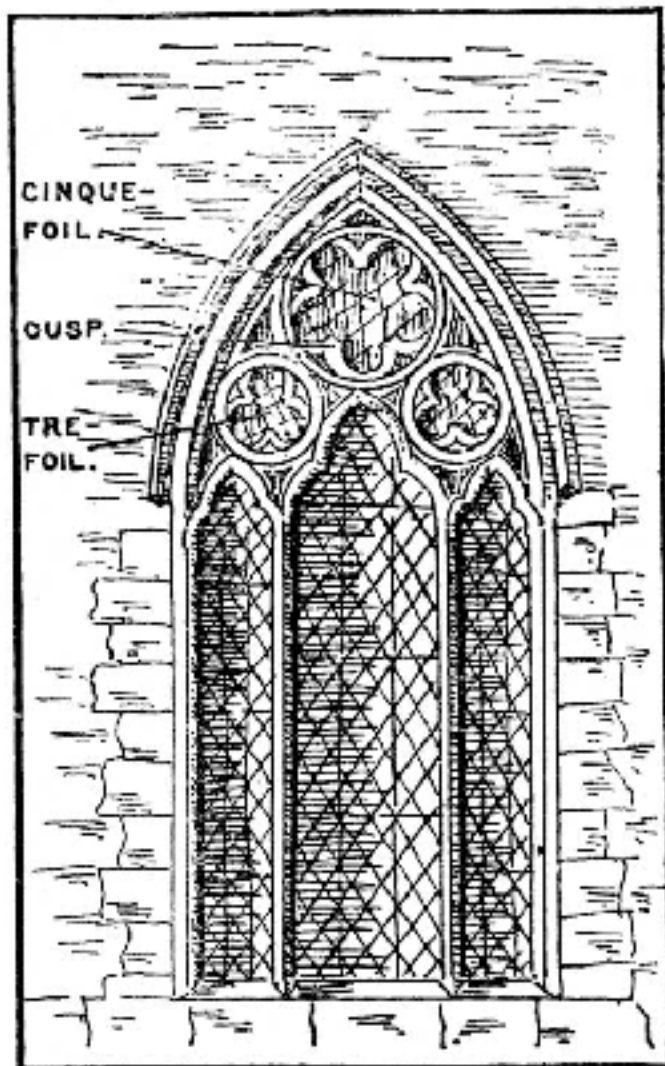
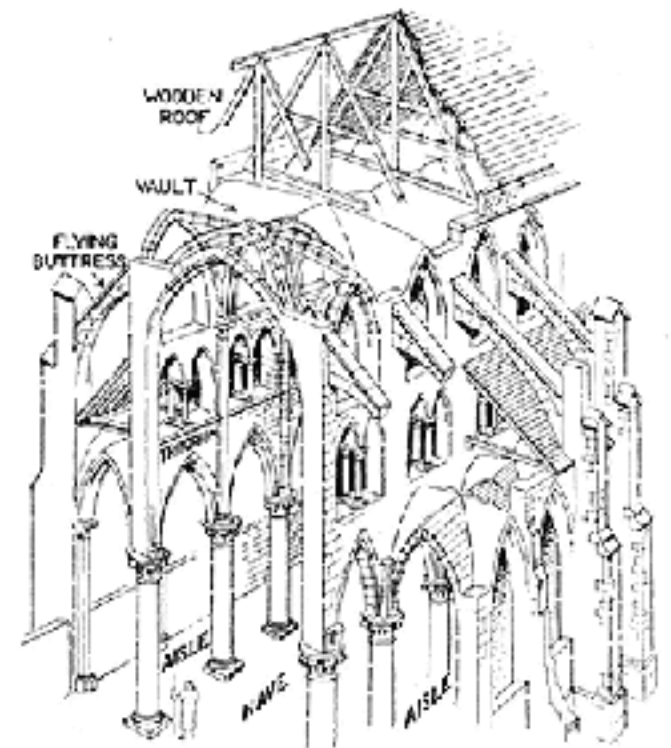
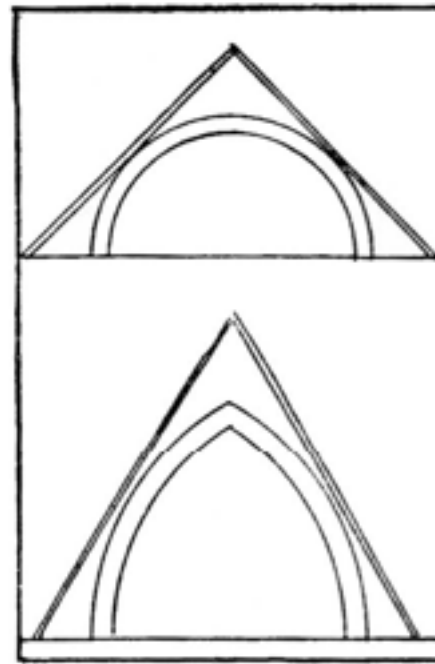
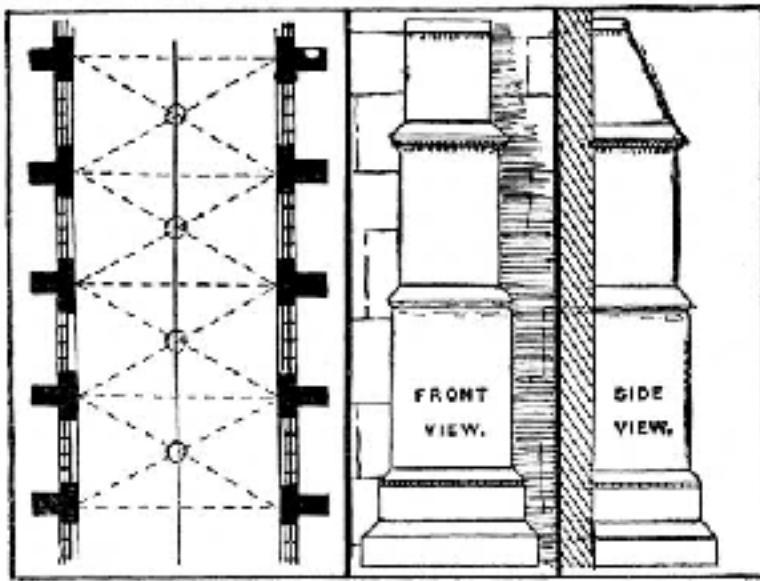
What do we mean by “**architecture**” “**architectural style**” in the context of software systems?

- There is **no single definition** for software architecture!
- The **architecture of a particular application** is a **description** of its **high-level structure** and **behavior**. It is a description of its **components**, how they **interact** with each other and with **external systems**.
- The **architecture of one particular** application is **documented** with a **collection of models** (**UML** diagrams are examples of such models).
- An **architectural style** is a **set of core principles and rules** (**architectural patterns**), which are **common** to a large number of different applications.

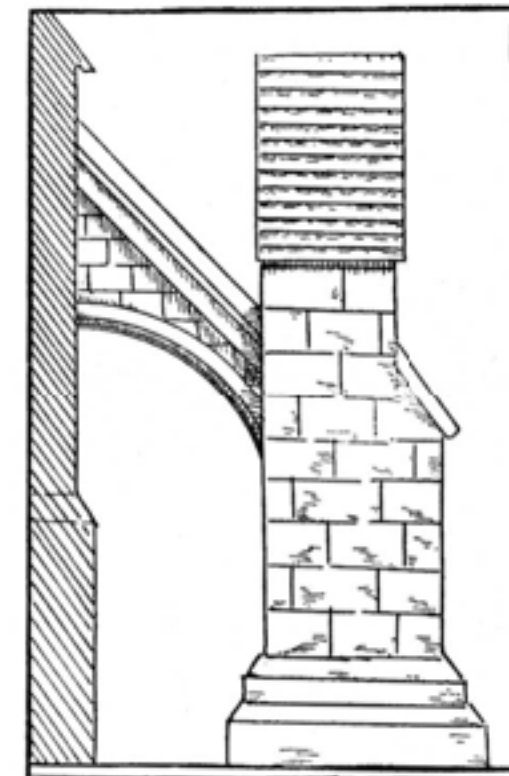


The Architecture of Bourges Cathedral





The Gothic Architectural Style





What are some of the well-known **architectural styles?**

- The client-server architectural style
- The 3-tiered architectural style
- **The multi-tiered architectural style**
- The RESTful architectural style
- The service oriented architectural style
- The event-driven architectural style
- The layered architectural style

Architectural styles are **not mutually exclusive**. Many applications combine patterns from several styles!

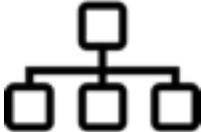


3-tiers, multi-tiers... **how many tiers** does a multi-tiered application have, and which ones?




human-readable
markup generation



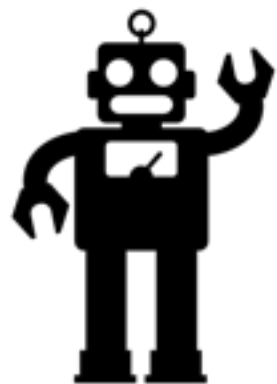

Page navigation




REST API



Shared business
logic and rules


Data access





machine-readable
markup generation


Message/
event bus



User

Client

Presentation

Business

Integration

Resources



What is the mapping between tiers, **logical nodes** and **physical nodes**?



Dev environment



Minimal environment



Simple environment

User

Client

Presentation

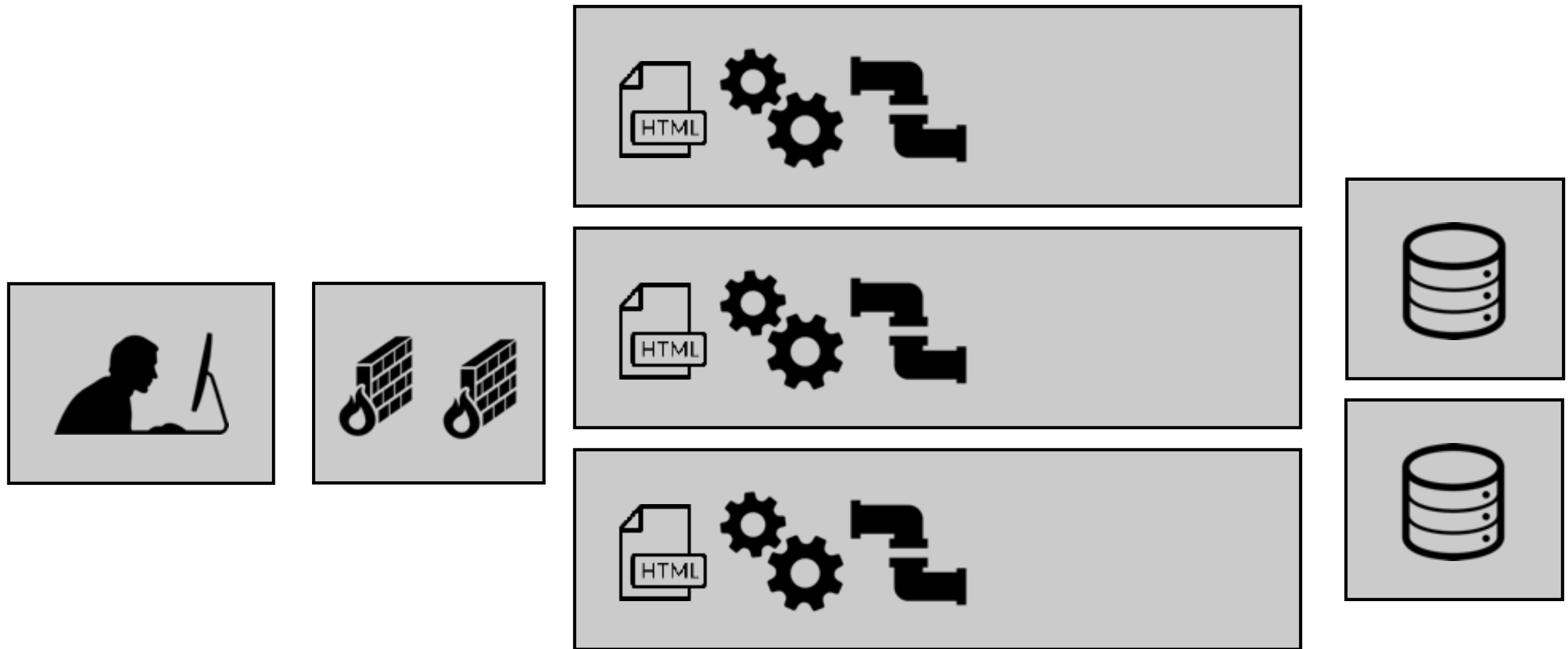
Business

Integration

Resources



What is the mapping between tiers, **logical nodes** and **physical nodes**?



Typical environment for scalability and availability

User

Client

Presentation

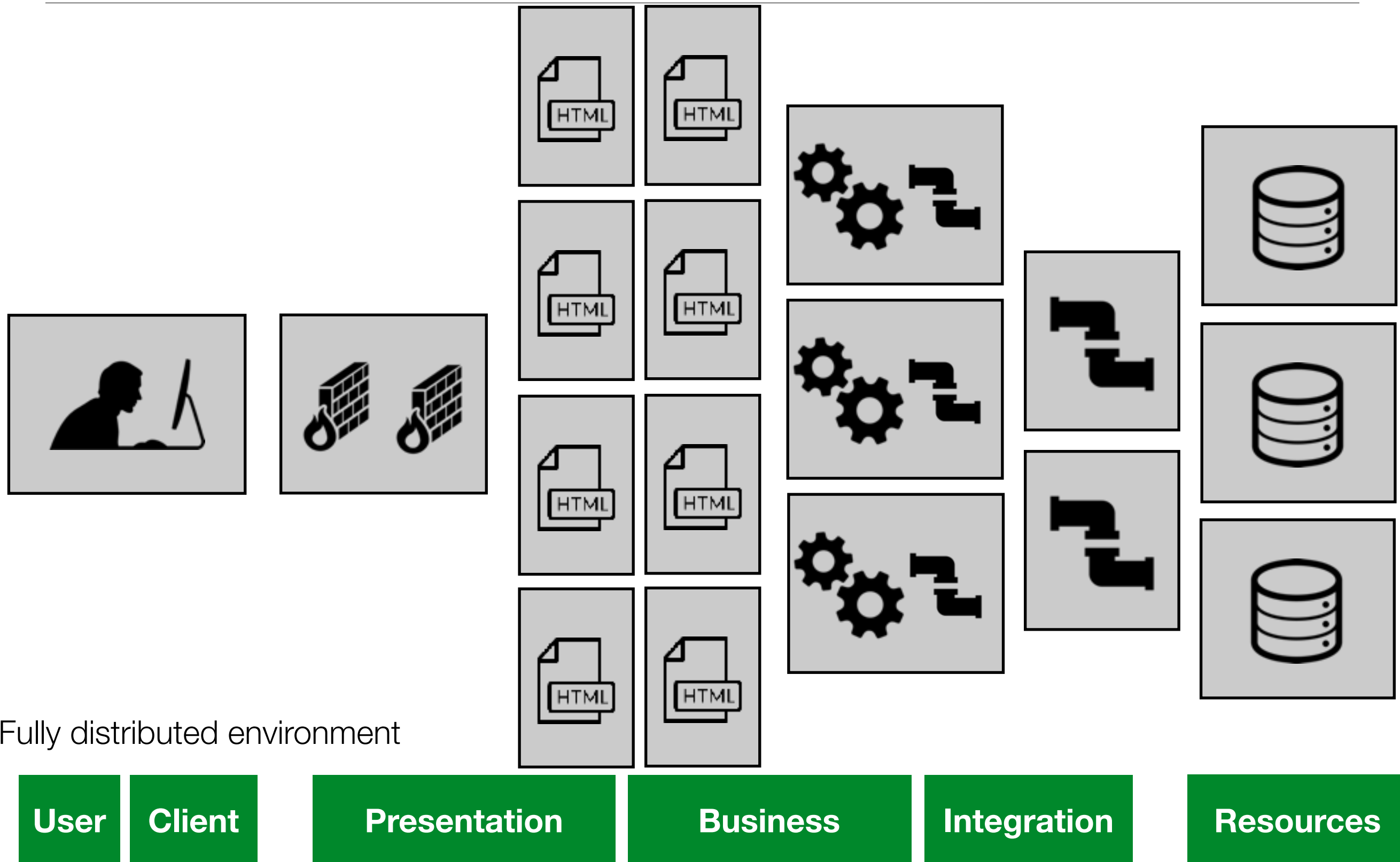
Business

Integration

Resources



What is the mapping between tiers, **logical nodes** and **physical nodes**?





What is the mapping between tiers, **logical nodes** and **physical nodes**?

- Just because it is **possible to physically separate the presentation and the business tier** does not mean that it is always a good idea!
- One reason to keep them in the same node is that **invoking a remote service is a lot slower than invoking a local service.**
- Introduce a **reverse proxy** as soon as possible. In simple environments (e.g. dev.), it does not require a physical node.
- **Database nodes** are often shared by several applications. Optimization techniques are fairly different for database and application nodes. They are often physically separated.

(Rapidly evolving) virtualization technologies gives us more options. Think about **Docker**, which allows you to “run a data center” on your laptop.



Java Enterprise Edition

What is Java Enterprise Edition?

- It is a **development platform**: it provides high-level APIs to develop software components.
- It is an **execution platform**: it provides an environment to deploy and bring these components “to live”.
- It is an **enterprise platform**: it provides support for distributed transactions, security, integration, etc.
- **Separation of concerns**: "The developer takes care of the business logic. Java EE takes care of the systemic qualities".



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Java EE and standards



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- **Java EE is a specification**

- Defined through the JCP, it is a specification that software editors can decide to implement. Java EE 5 is defined in JSR 244.

- **Java EE is an “umbrella” specification**

- Java EE builds upon other specifications (servlets, EJBs, JDBC, etc.) and specifies which specifications (and which versions) need to be implemented by a Java EE certified application server.
- Java EE also defines a programming model and defines several roles (developer, assembler, deployer, etc.).



Specification Lead

★ Bill Shannon Sun Microsystems, Inc.

Expert Group

Barreto, Charlton
Capgemini
Dudney, Bill
Hewlett-Packard
Kohn, Erika S.
Oracle
Pratap, Rama Murthy Amar
Reinshagen, Dirk
Shah, Suneet
Tiwari, Ashish
Umashathy, Sivasundaram

BEA Systems
Chandrasekaran, Muralidharan
Epiphany, Inc.
IBM
Leme, Felipe
OW2
Raible, Matt
SAP AG
Sun Microsystems, Inc.
Tmax Soft, Inc.

Borland Software Corporation
Crawford, Scott
Genender, Jeff
Ironflame AB
Novell, Inc.
Pramati Technologies
Red Hat Middleware LLC
SeeBeyond Technology Corp.
Sybase
Trifork

J2EE or Java EE?

- Java Enterprise Edition is **not** a recent specification.
- The SDK 1.2 was published in 1999.
- The specification is managed through the JCP since version 1.3
- We used to talk about "Java 2 Enterprise Edition 1.3", or J2EE 1.3
- We then moved from J2EE 1.3 to J2EE 1.4 to... **Java EE 5**
- Today, we should speak of Java EE, but J2EE is still sometimes used...
- Java EE 7 was released on May 28th, 2013
- Java EE 8 was released on August 31st, 2017. Seriously?



Watch out! Java EE (formerly known as J2EE)
has evolved a lot over the years!

I personally thought that Java EE, as an umbrella specification, was dead.

The JSRs that are part of Java EE (servlets, JAX-RS) would continue to live and evolve, but they will be used directly by independent application frameworks (like Spring)



Then, this happened, in 2018...



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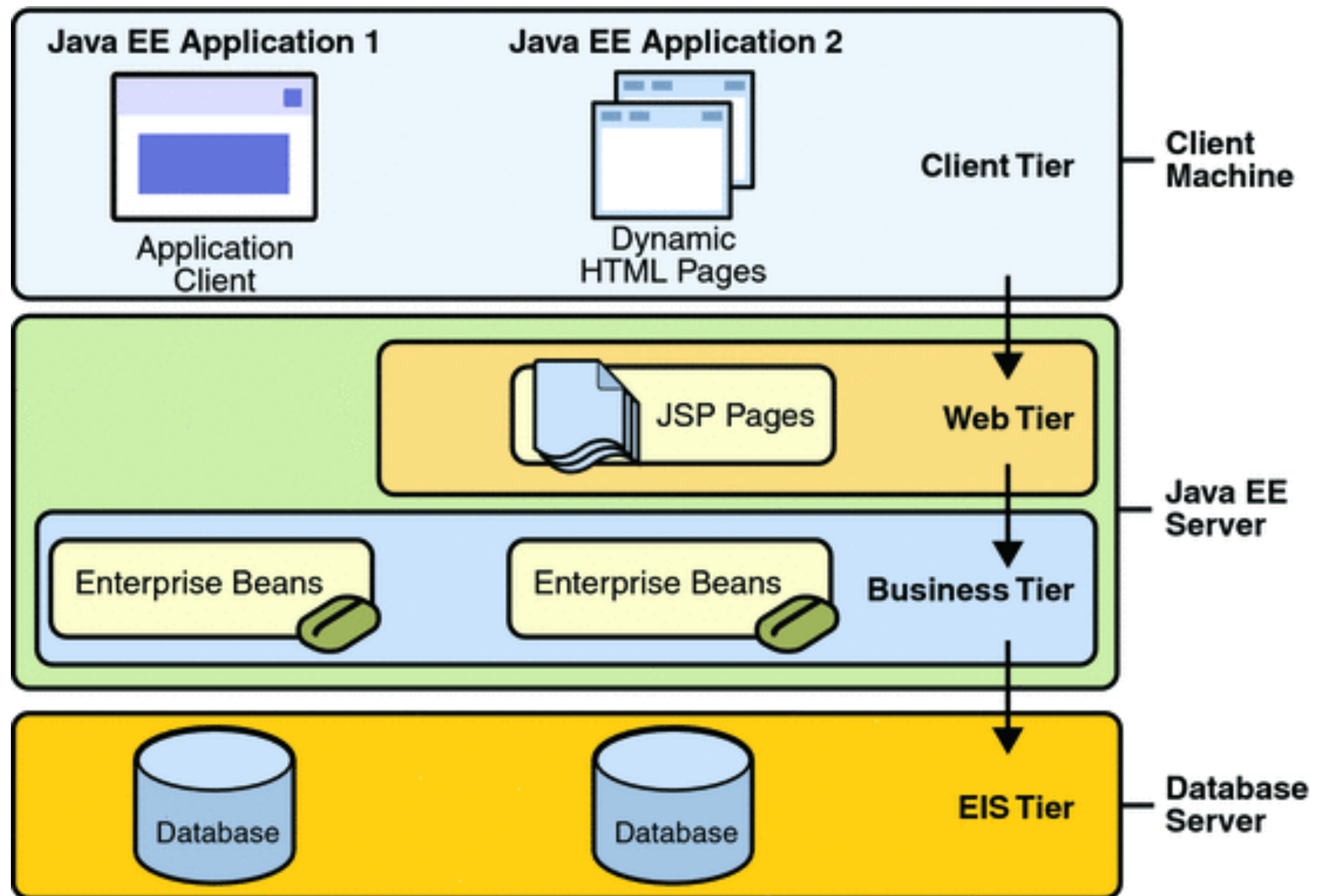
Strategic Members



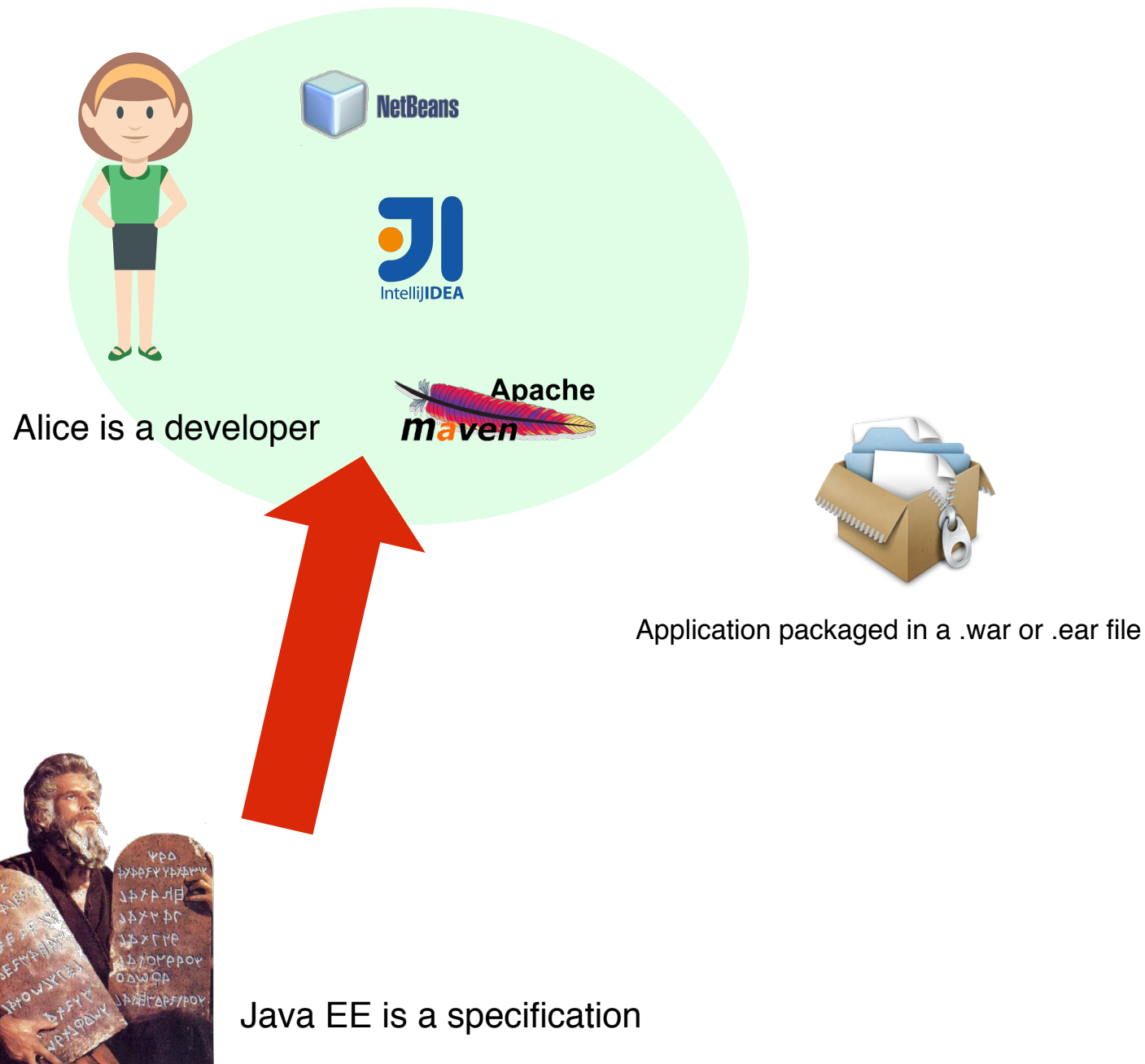
Participating Members



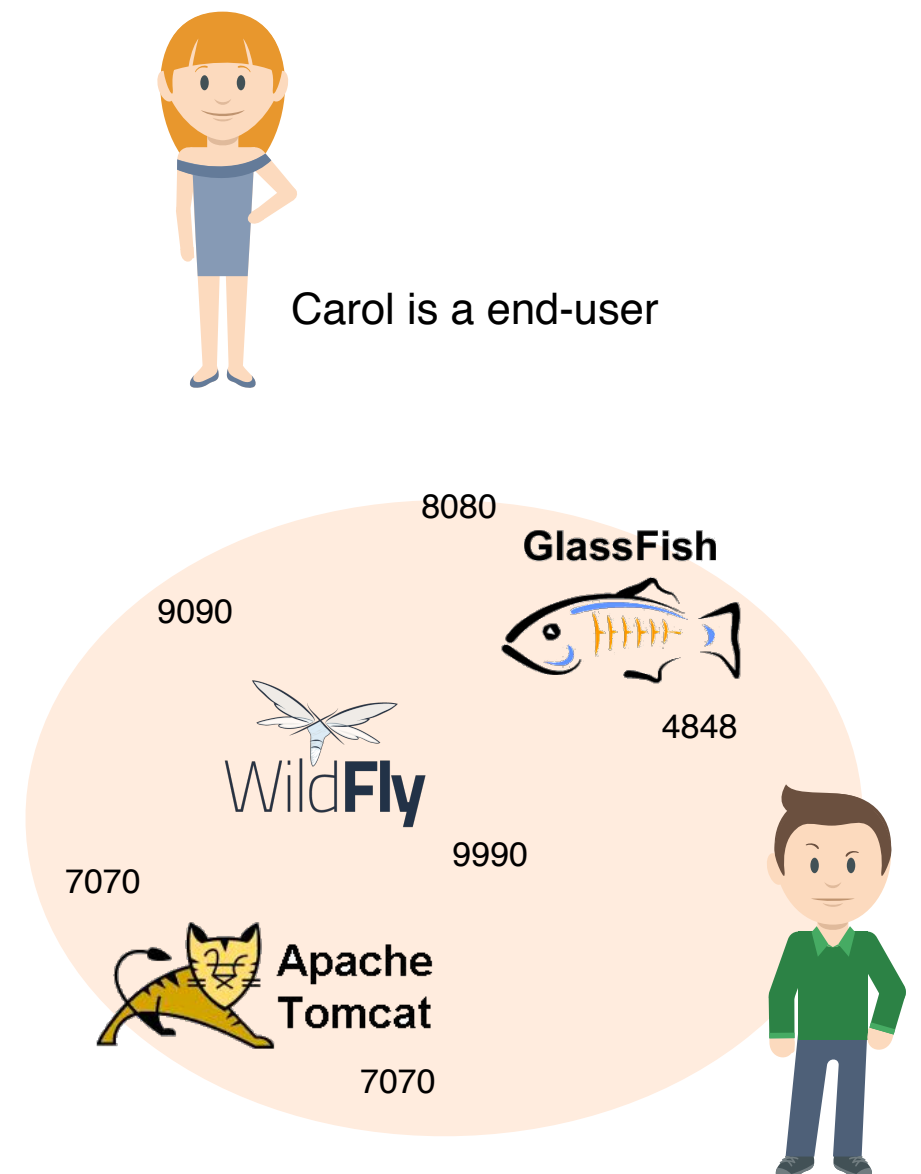
- The software that implements the Java EE specification is called an “**application server**”
 - There are **open source** and **proprietary** application servers.
 - Glassfish, JBoss, WebSphere, BEA WebLogic are examples of application servers.
 - Editors compete on aspects that are not defined the specification (clustering, administration, etc.).
- Key notion in the Java EE architecture: the **containers**
 - a container is an **environment** in which we deploy components;
 - a container **provides services** (transactions, security, etc.) through APIs;
 - there are different containers in Java EE: the “**web**” container, the “**ejb**” container and even a “**client**” container that can be used for rich clients.



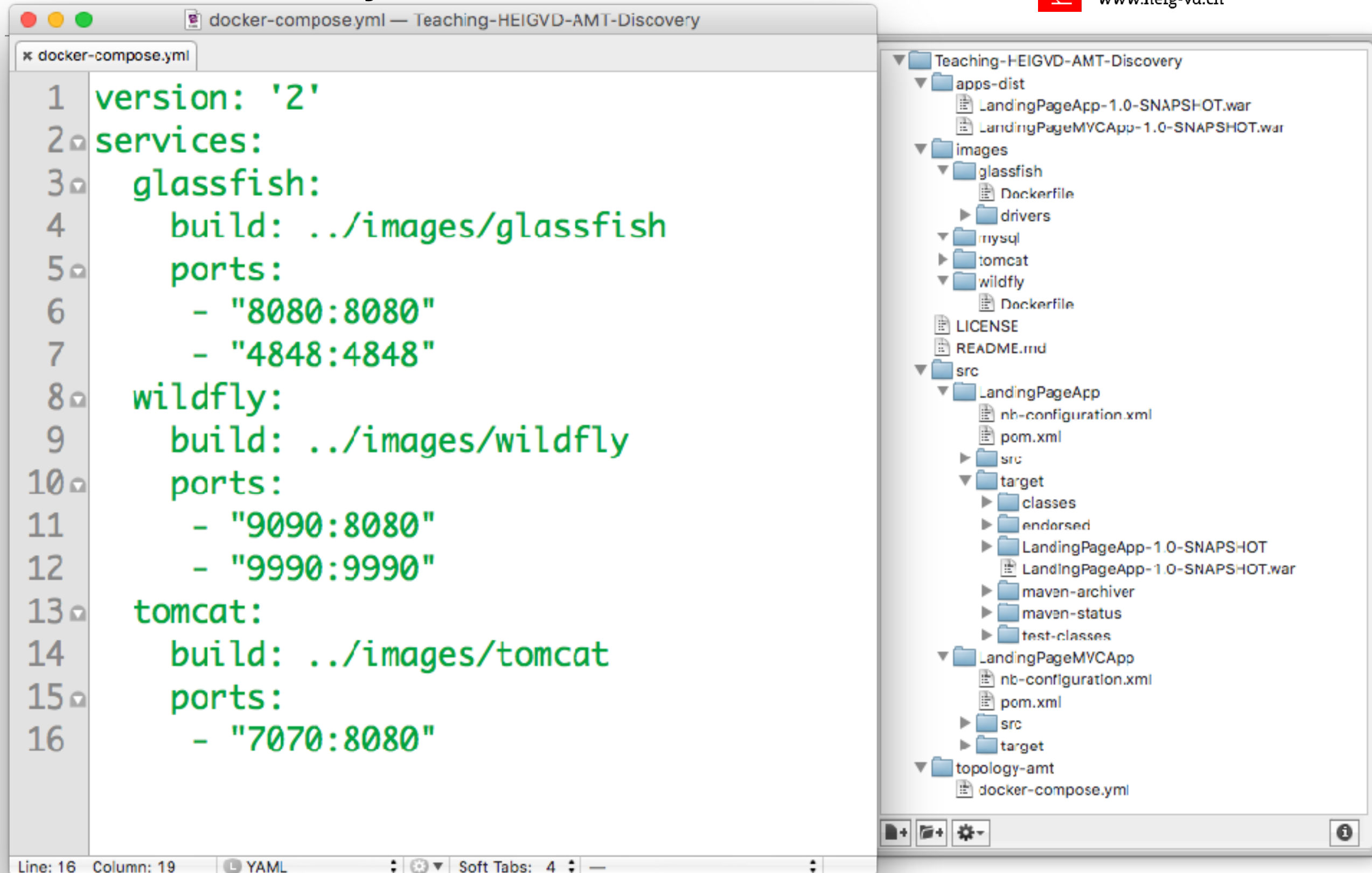
AMT-Discovery



The Java EE development cycle



AMT-Discovery



The image shows a code editor window titled "docker-compose.yml — Teaching-HEIGVD-AMT-Discovery" and a file explorer window showing the project structure.

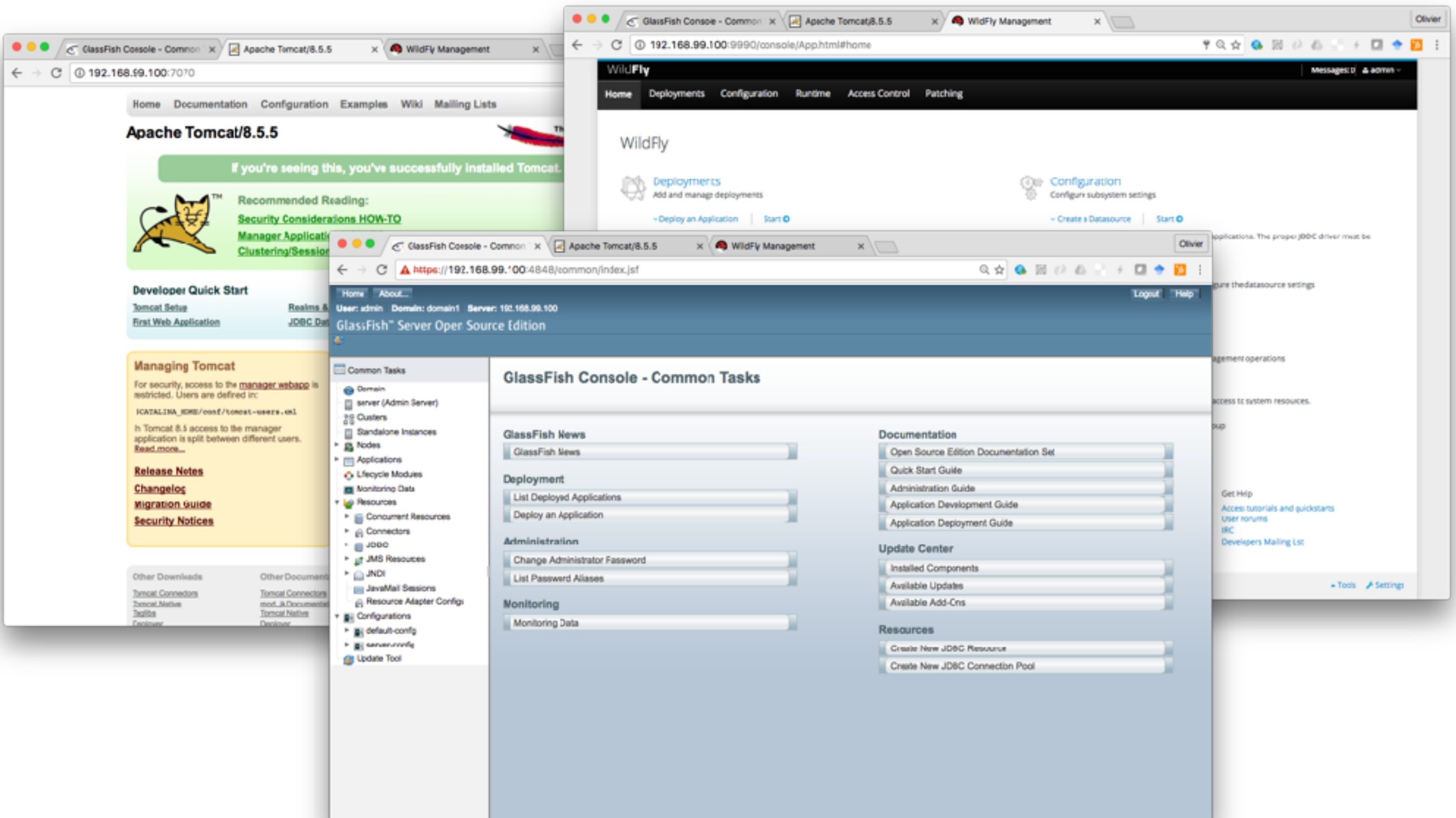
docker-compose.yml content:

```
1 version: '2'
2 services:
3   glassfish:
4     build: ../images/glassfish
5     ports:
6       - "8080:8080"
7       - "4848:4848"
8   wildfly:
9     build: ../images/wildfly
10    ports:
11      - "9090:8080"
12      - "9990:9990"
13  tomcat:
14    build: ../images/tomcat
15    ports:
16      - "7070:8080"
```

File Explorer Structure:

- Teaching-HEIGVD-AMT-Discovery
 - apps-dist
 - LandingPageApp-1.0-SNAPSHOT.war
 - LandingPageMYCApp-1.0-SNAPSHOT.war
 - images
 - glassfish
 - Dockerfile
 - drivers
 - mysql
 - tomcat
 - wildfly
 - Dockerfile
 - LICENSE
 - README.md
 - src
 - LandingPageApp
 - nb-configuration.xml
 - pom.xml
 - src
 - target
 - classes
 - endorsed
 - LandingPageApp-1.0-SNAPSHOT
 - LandingPageApp-1.0-SNAPSHOT.war
 - maven-archiver
 - maven-status
 - test-classes
 - LandingPageMYCApp
 - nb-configuration.xml
 - pom.xml
 - src
 - target
 - topology-amt
 - docker-compose.yml

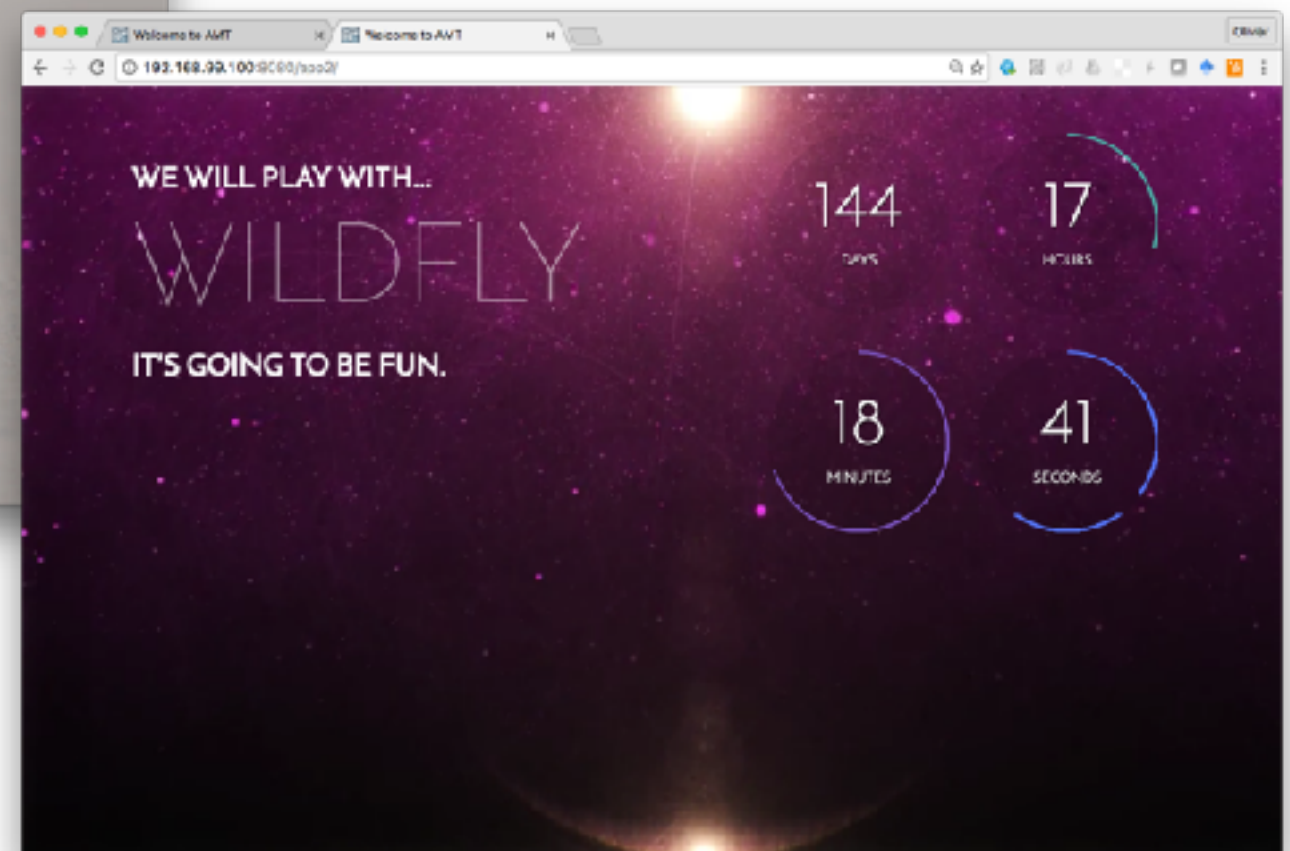
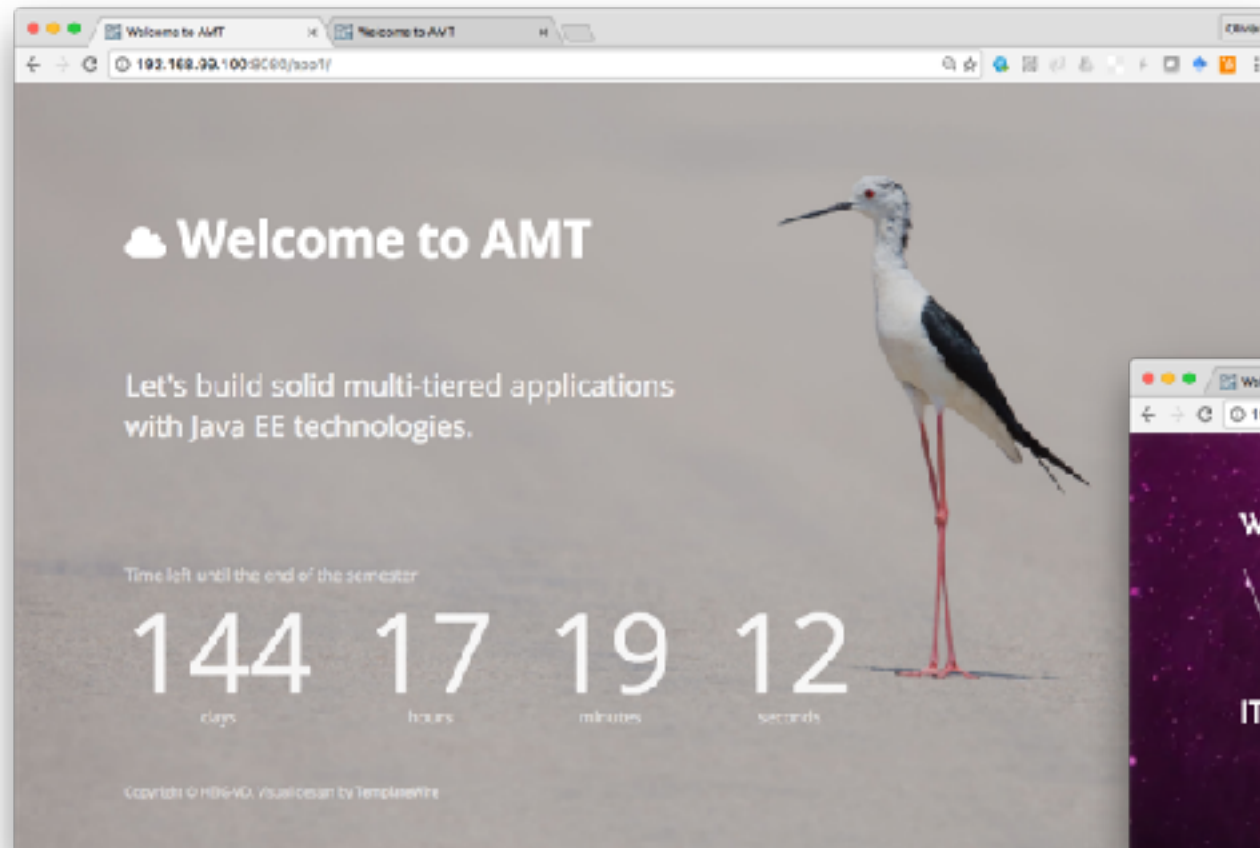
AMT-Discovery



AMT-Discovery



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Questions?



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